

Albert-László Barabási



The

Formula



The Science Behind  
Why People Succeed or Fail

'This is not just an important but an imperative project'

NASSIM NICHOLAS TALEB, AUTHOR OF *THE BLACK SWAN*

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# Albert-László Barabási

Author of *Bursts: The Hidden Pattern Behind Everything We Do*

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THE

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THE UNIVERSAL  
LAWS OF SUCCESS

< THE SCIENCE BEHIND WHY PEOPLE SUCCEED OR FAIL >

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# THE Formula

THE UNIVERSAL  
LAWS OF SUCCESS

Albert-László Barabási



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## INTRODUCTION

### Success Isn't About You. It's About Us.

My wife says she fell in love with me because I knew the temperature of the sun. I met her in a coffee shop while preparing to teach my students the basics of thermodynamics. “How could we possibly know such a thing?” she asked. The idea that I could pin a number—5,778 kelvin, to be precise—on something so far away, something so untouchable, so violently, immeasurably incendiary—seemed like a magic trick. It’s the kind of answer any parent would love to supply to the questions kids tend to ask. Instead, we admit, “I don’t know,” or speak in vague terms. “The sun is hot. Really hot.” But we’re talking about the glowing orb that illuminates our lives, the source of life as we know it. I found it baffling as a child that adults knew precious little about something so big.

My grandfather owned a fleet of trucks in his small Transylvanian village, but by the time I came along, all he had left of his business was his machine shop, a cavernous wooden shack where I spent every one of my vacation days. I loved that shop, which was in some ways my first laboratory, a place where I could safely break something down to its nuts and bolts, study its gears, and see exactly how it operated. Understanding what made something work—that was the fascination. It still is.

I come from a family of tinkerers. After Communism robbed my grandfather of his fleet of trucks, he fixed appliances for the whole neighborhood, examining the innards of an iron or a radio with patient confidence. My dad, a truck driver for the family business at a mere ten years old, could crawl underneath an ailing car, poke around for a few minutes, and emerge with blackened fingers and a pleased expression, the problem fixed. He spent his life always running something—a school, a museum, a company—approaching each job with the mind-set of a tinkerer, rolling up his sleeves and making it work no matter the circumstance.

Maybe it’s a tinkerer’s curiosity that turned me into a scientist. Early on,

physics allowed me to explore the sprockets and gears of the universe and the very forces that control our lives. Looking for more challenges, I turned later to the complexities of networks and data. For a vigilant asker-of-questions, I've chosen the right corner of the scientific world to call home. As long as a line of inquiry is based on numbers—the more the merrier—I can pursue it doggedly, following its scent through the maze of data now available to researchers in our hyper-connected, technological world. Hunting down an answer inevitably leads to more questions, new possibilities that hover like gnats on the periphery of any research I conduct. I try to swat them away and stay focused on the task at hand, but I'm not that different from the kid I once was, stubbornly asking “Why?” in response to... well, pretty much anything. It is the quest for answers that gets me up in the morning and keeps me up at night.

These days I run the Center for Complex Network Research, in Boston, where my job is exploring the “why” behind topics as varied as how people or molecules interact, where and how links form, and what our interconnectedness can tell us about society or our biological origins. We've examined the topology of the World Wide Web. We're looking at how tiny hiccups in our genetic networks lead to disease. We're exploring how our brains control their billions of neurons and how molecules in food attach to our proteins, ensuring our long-term health.

I love this kind of stuff—the math behind our social fabric, the way numbers provide a framework for understanding the essence of our connectedness. When I use models and tools to delve into unlikely topics for scientific analyses, these frameworks inevitably deepen our knowledge.

That's precisely what we did with success. It took a few years, but after harvesting mountains of data on human accomplishment, we figured out a way to break the concept down to its constituents and study its gears. Our goal was to formulate success as a mathematical problem that computer scientists and physicists, using the unforgiving tools of quantitative science, could address in a definite fashion. It wasn't that different from pulling apart a bike, or using thermodynamics to fathom solar heat. Once we started seeing the mechanisms that create success, we began to answer the kinds of impossible questions I tortured my parents with as a child.

Exactly how, for instance, did we decide that *this*—the blurry, unremarkable photo hanging in the Museum of Modern Art—is a masterpiece?

Why is *Carousel*, not *Cats*, the best musical ever?

Are expensive schools worth it?

Why are there a mere handful of superstars in any field?

Add these to the hundreds of other questions about success, achievement, and reputation that seem, like the sun's temperature, impossible to pin down. Is it our performance that pushes us up the corporate ladder? Do we get less or more creative over our lifetimes? Should we collaborate or compete with superstars? How do networks—social and professional—affect our access to success?

Believe it or not, quantitative answers can be found for all these seemingly unquantifiable questions. By examining the patterns in the data and identifying the mechanisms that produce success, we determined that we could address each of the questions head-on. Once we began to comprehend the universal forces at work behind our individual successes and failures, fascinating findings started to emerge.



We started with disaster, backhandedly landing on success. At the time, my lab was analyzing cell phone data to understand how people react to major catastrophes. Recognizing that this was a good opportunity for one to learn by doing, I assigned Dashun Wang, a gregarious, Chinese-born Ph.D. student, to help with the ongoing project. The endeavor resulted in a truly fascinating paper, one that I was certain would have a major impact on disaster relief efforts worldwide.

Except... no one else thought so. Try as we might, we couldn't get it published. The highest-tier and then some of the lowest-tier journals rejected it. We joked that we should have removed the word "disaster" from the title, since that likely destined it for failure.

A lifelong basketball player, Dashun shrugged off our disastrous paper as if it were a setback on the court. The ironies amused him. But when he and I met one night to discuss his next project, he was eager to move on.

"I'll do pretty much anything but work on another disaster," he said with a chuckle.

"Then let's make your next project a success," I said. "How about the Science of Success?"

I'd meant the question to be tongue-in-cheek. Except as soon as I said it, we

both knew that we'd stumbled onto something interesting. Why *not* apply our methods to the study of success? It seemed that studying success would not be all that different from studying catastrophe. We can accurately predict the trajectory of a hurricane by examining a big pile of data points and using them as input for weather models. These predictions are hugely valuable in developing a response plan. Communities that lie in a hurricane's projected path prepare to batten down the hatches; the rest get ready for sprinkles and buy umbrellas. We don't question the validity of the forecast, though a century ago prophesying a monumental storm would have seemed like witchcraft. Why, then, couldn't we do something similar with success? Data collected in unexpected realms and filtered through sophisticated mathematical models, after all, can seem like a kind of magic.

We started out small and focused on a specific area: success in science. We realized that in the digitized era we now live in, we had troves of detailed records about our own discipline—catalogues of research papers going back over a century. Why not put science itself under our data microscope? The project sought to answer some of my most puzzling, fundamental questions: How does success emerge? How can it be measured? Why are some of my biggest heroes—remarkable scientists whose discoveries have enriched my life—so doomed to invisibility that they hardly appear in a Google search? And why are others whose work is not any more remarkable or novel propelled to stardom?

In no time, we started seeing patterns in the data, which turned into formulae we could use to *predict future outcomes* for ourselves, our colleagues, and even our professional rivals. As I'll discuss later in the book, we could actually fast-forward a scientist's career to determine her future academic impact, gauging her chances of making it big or having her contribution appreciated by only a few kindred souls within an already esoteric discipline. We also developed an algorithm to predict precisely who, among hundreds of contributors to a discovery, would get most of the credit, and—spoiler!—it was rarely the person doing the lion's share of the work.

The most unexpected outcome? Finding a courtesy-van driver at a Toyota dealership in Alabama who had inexplicably been overlooked for a Nobel Prize. And he's just one in the collection of characters we met on our journey toward understanding success. Among them were also the guy who crowdfunded \$10,000 in eight minutes, a Harley-riding success researcher with a passion for

Broadway musicals, and a former oceanographer turned winemaker whose discovery of ugly truths has changed the way I buy wine.

Our first Science of Success project took two years to complete, and its findings opened up a new realm of inquiry ripe for further exploration. The resulting paper, Dashun's first as lead author, was published in *Science*, the most prestigious journal out there. He and I were both a bit stunned. In running from disaster, we stumbled across success.



What I was learning about my own field of science captivated me, and it quickly became clear that we could use the same approach to examine success in other realms. Did the same patterns apply to accomplishment in sports, to rewards in art, to high achievement in sales? Could we foresee which TV show or book would become a sensation just as we could forecast the success of new scientific discoveries? Could we predict a career in business in the same way we could now anticipate an unfolding academic one? What if the patterns and regularity that we saw in the way scientists succeed and fail reflected some deeper truths that apply to all of us? What if our mathematical tool kit showed that success in all realms obeys the same universal laws?

To be honest, it was a risky proposition. A glance at the existing success-related literature, which lines an entire wall at my favorite bookstore, told me that most writing about the topic relied on inspirational messages and anecdotal evidence, a far cry from the hard theorems and flinty empirical data to be found on the science shelves.

But what those books also tell me is that people have a deep hunger to understand what contributes to success. It's a topic that obsesses many of us. And well it should. Success is not only a fundamental aspect of human experience, both practical and existential, but is also often a fundamental marker by which we measure the life we are leading. Whether we'll fail or thrive in our chosen careers or even hobbies matters deeply. When we make a discovery, produce a piece of art, or design a new gadget, we want to make sure it will have an impact on the world. We puzzle over the fine line between success and failure daily as we envision our own future trajectory or as we steer our children into adulthood. If only we could find patterns of success in a whole range of fields,

perhaps we might be able to make sense of what we far too often attribute to chance.

Propelled by this possibility, I challenged my lab members to discover the quantitative laws that govern success. Each success story is bound to leave a trail of data points behind. I hoped not only to capture these trails but also to identify the patterns that success obeys and the drivers behind them. And we did just that, meticulously gathering data from multiple fields—the arts, academia, sports, and business—and analyzing it on a large scale. We purchased massive databases containing all the research papers ever written, allowing us to rebuild the careers of every published scientist going back a century or more. We bought access to the weekly sales patterns of all books sold in the United States, data that helped us examine the commercial success of each author independent of the genre they worked in. We were given access to information about global gallery and museum exhibits, which allowed us to rebuild the careers of all contemporary artists, identifying the invisible networks that guaranteed success for some of them. We scoured massive data sets pertaining to success in sports, business, and innovation. Then we put all of it under the quantitative microscope that our lab and others have developed over the past two decades. We took these tools—hardened by decades of work by computer scientists, physicists, and mathematicians interested in unveiling the secrets of the universe, curing genetic diseases, or finding valuable information in milliseconds among billions of Web pages—and the mathematical rigor behind them and applied them to the massive data sets that capture how we encounter and experience success. And to better survey the potential behind this new field, we also organized a symposium on the Science of Success, held at Harvard University in May 2013. Over a hundred researchers, everyone from sociologists to business professors, came to share their findings. As we put our heads together, we were suddenly seeing a *series of recurring patterns that drive success in most areas of human performance*.

Because the patterns that began to emerge were so universal, we started to call them the Laws of Success. Given that scientific laws are immutable, doing so probably seemed brash to outside researchers. But the more we explored and tested them, the more solid and general they appeared. Crucially, like the laws of gravitation or of motion, the Laws of Success can't be rewritten to fit our needs or beliefs, no matter how righteous or strongly held. And outright resisting them is about as futile as trying to fly by flapping our arms up and down. But—just as engineers use their understanding of fluid mechanics and plenty of tinkering to improve airplane technology—we can take advantage of the Laws of Success to

invent our futures.

In the upcoming chapters, I will delve into the far-reaching scientific inquiries that support each law. My goal with *The Formula* is to outline our discoveries so that readers, aware of the complex but consistently reproducible mechanisms that generate success, can use this knowledge in their own lives. But this is not a self-help book. I like to think of it, instead, as “science help,” a framework that uses science to understand and orchestrate outcomes. Scientific analysis can illuminate seemingly deeply irrational puzzles, turning our assumptions on their heads. In other words, science can help us make sense of the randomness of the human world—unveiling the mechanisms at work when we’re passed over for a job, the underlying pattern that explains why some artists thrive while others fail, the lingering hunch that success is about more than just talent or how well we perform.

As I’ll discuss in the conclusion, despite his evident genius, even Einstein’s success was no foregone conclusion. In fact, much of his rampant recognition hinges on events completely divorced from his contributions to science. Across the board, the research indicates that we can’t rely on sheer instinct, strong performance, or all the old inspirational clichés if we want our work to be appreciated, our accomplishments to be noticed, and our legacies to endure.

In fact, for the purposes of this book, we’ll be defining success along these lines: it is the rewards we earn from the communities we belong to. In the case of Einstein—the “Man of the Century,” according to *Time*—that reward is fame. But it can be recognition if you’re a collaborator, visibility if you’re a brand, renown if you’re an artist, album or ticket sales if you’re a musician, revenue if you’re in business or sales, earnings if you’re a banker, audience if you’re a playwright, citations if you’re a scientist, endorsements if you’re an athlete, and impact if you hope to make a difference in virtually any field. These success measures all have one thing in common: they are external, not internal; collective, not individual.

This is not to say that we can’t experience success as something deeply individual. Personal growth, satisfaction, and depth of experience are powerful and significant. Our framework for success doesn’t preclude such measurements, nor should they be regarded as mutually exclusive from success as I’m defining it. They often go hand in hand, our satisfaction growing with the impact we’ve made. But as a scientist, I can’t measure individual fulfillment any more than I can assign a number to happiness. Private definitions of success are unique to each of us, so they’re invisible to our approach to big data. A perfectionist may



perceive even a much-praised performance as a failure and argue that true success comes only when she feels genuinely satisfied with her labors. She wouldn't be wrong. Nor would the guy who finishes his unpublishable novel but considers it a success because he met a personal goal by completing it. These are triumphs essential to who we are and why we get out of bed in the morning. My life, too, is full of personal goals—to be a good father, an insightful mentor, and an astute speaker paramount among them. I'd love to find a way to explore success through this far more personal lens. Sadly, I haven't found a way to do so, since individual aims remain stubbornly inaccessible to our methods of research. They've proven to be unmeasurable so far.

Let's say you're a talented skater recovering from knee surgery. You work with your physical therapist; you toil through repetitive exercises. You set goals and make painful but incremental progress. Then the day comes when you don't need crutches. You take three steps. Ten. You eventually lace up your skates and get back in the rink, a moment of victory. This is when the triumphant music sounds, should Hollywood tell your story. Call it the biggest success of your life, and I'd fully agree with you.

Yet in this book we'll refrain from calling this "success." It's not that we'll ignore this kind of achievement. Rather, we'll call it performance. You reached an important goal through hard work. But the rewards were internal, centered on personal satisfaction and fulfillment. They matter, of course. They matter a great deal. They matter to you and to your physical therapist; they matter to your coach and to your family, just as achieving a milestone at work is significant to you and your boss. They may even enhance your future performance. But when I talk about success being collective and not individual, requiring a *community's* response, I mean that we need to be able to observe the ripple of impact your performance has on the people and environments you move within. We need to see how your performance matters to us.

Remember the old philosophical chestnut: If a tree falls in the woods and no one is around to hear it, does it make a sound? According to our new understanding of success, the answer is a resounding no. Audiences won't applaud your earth-shattering, disruptive achievement unless they can witness its impact. In an era when we can track human behavior with almost topographic accuracy, big data allows us to map success by measuring collective response to your performance. In the highly technological, plugged-in present, not only can we examine the circumstances through which success emerges, we can see how it spreads through the networks that connect us, touching faraway communities.



So while I recognize the importance of personal fulfillment, it's not a factor I can consider in my work as a researcher. Respecting that boundary has been oddly freeing. The popular definition of success reinforces the perception that "success" is as loose a concept as "love." The topic's vagueness kept scientists away—they assumed that it couldn't be studied. Realizing that success is a collective phenomenon throws that perception out the window. Once we defined success along external lines, a whole new set of possibilities opened up. We could measure and quantify it, using tools of scientific inquiry. And once we did that, we could unveil the laws that govern our success.

These laws are what separate the best seller from the bargain bin and the billionaires from the bankrupt. They illuminate how flawed competition protocols are, many of which effectively determine a winner by lottery. They show how "experts"—professionals who assess wine, classical music performances, figure skaters, or even other judges—are often no better at ascertaining quality than you or me. They explain why that guy who dominates staff meetings but shows up late and unprepared on all other occasions somehow becomes your boss. They show us that taking a risk on an underdog can have enormous impact, or that a single, initial donation can make or break a fundraising campaign. They even elucidate how a thoroughly terrible song—insert your nomination here—mystifyingly becomes a hit. The Laws of Success have governed our lives and careers as immutably as gravity through the centuries, and yet, until recently, we did not know they existed.

Before big data and the Science of Success, we assumed luck or hard work or talent, mixed together in some magic, unknowable proportion, were all that mattered—myself included. As an immigrant from Transylvania, first a political refugee within Europe and then a hopeful student, I believed that hard work alone was my best strategy. I was doubly committed to showing that I could succeed in America. But my only game plan for making it in science was to perform exceptionally, to make a discovery with lasting impact, to conduct research so groundbreaking that it couldn't be ignored. Years ago, my lab members taped a picture of the Energizer Bunny on my office door, with my face superimposed over its furry pink jowls. And even now I can't stop. I continue to work with a single-mindedness that can be infuriating to the people I'm closest to. These are things I can't really change about myself, though I've certainly tried. I believed in hard work as a child, and I believe in hard work now. But as the Laws of Success started to unfold before my eyes—as I saw patterns on a large scale that in individual cases seemed random—I was shocked by my own

ignorance.

While I now know that performance remains crucial, I also know that it's only *one variable* in the formula for success. Other variables that we will unveil in the coming chapters are just as indispensable. When we break down and demystify the ingredients of success, we grasp what we can control in our lives—and what we can't. Because just like the laws of nature, the Laws of Success don't necessarily apply to all of us all the time. But they do come into play when we engage in specific activities. Aerodynamics are crucial if you're flying, friction if you're driving, and fluid dynamics if you take a boat. Different laws and formulas apply depending on what means of transportation you choose. The Laws of Success are similar—our insights into team success aren't going to illuminate the triumphs of an artist who works exclusively alone.

But we can use the laws to understand how invisible forces shape our successes and failures, knowledge I've found truly revelatory. As a kid, I was more of an artist than a scientist. Then, a few weeks into my first high school physics class, I earned an eight out of ten on a pop quiz that everyone else failed. I beamed in astonished pride when the teacher praised me. I don't think I was particularly gifted at physics, and I certainly wasn't passionate about it yet. The only reason I'd earned a decent 80 percent score was because a friend of my parents', an engineer, happened to be staying with us, and the night before the quiz he'd coached me through my homework.

Oblivious to the forces that had boosted my performance, I left the classroom that day with newfound confidence. It was the first success I experienced in science, and it stayed with me long after I'd graduated. It's fair to say that the rest of my life hinged on that moment. Because, without fully realizing it, I'd encountered the first of the many complex mechanisms at work that shaped my career. What underlies that experience—and all my later moments of personal triumph—are captured by the Laws of Success.

# 1

## The Red Baron and the Forgotten Ace

In 1915, commanders in the German military received a complaint from a young cavalryman named Manfred von Richthofen, who wrote, “I have not gone to war to collect cheese and eggs, but for another purpose.” The son of a prominent Prussian family, he was a military school graduate and passionate hunter, and he didn’t want to spend the war in the army’s supply branch. He wanted to see combat. Whether because of his enthusiasm or noble birth, he was granted his wish, a transfer to the air force.

It’s true, von Richthofen’s talents would have been wasted as an egg collector. He needed only twenty-four hours of training to take his first solo flight, in a brand-new Albatross biplane. With an open cockpit and skeletal frame balanced on two thin wheels, it was impossibly rickety by modern standards. Yet only a month later, von Richthofen had already scored six kills against Allied planes. He was fearless, sometimes flying four missions a day over the battle-gutted farmland of occupied France and descending on Allied pilots in brutal aerial assaults. He made wreckage of twenty-two planes in April 1917 alone, a month that came to be known in aviation history as “Bloody April” because of the extreme losses the Allies suffered. During his three-year career, von Richthofen gunned down eighty planes. That’s more, by official standards, than any other ace pilot in World War I.

Von Richthofen also did something that now seems highly incongruous in our era of spending billions to make airplanes invisible to enemies. He painted his wasplike plane a taunting, brazen red. The color of the aircraft, moving across the sky like blood smearing a butcher’s apron, became the vivid source of his famous nickname: the Red Baron. It embodies the spirit of a brash nobleman who ordered a custom-engraved trophy from a high-end jeweler in Berlin for each of his kills. He accumulated sixty before Germany, squeezed by the hardships of war, ran out of silver. He continued to fight but quit collecting the cups—trophies made from base metal simply wouldn’t do.

The Red Baron's story survives a century later, and not just in Germany. He is the subject of more than thirty books, including his own 1917 autobiography, which he wrote from a field hospital while recovering from a head wound. He's featured in Hollywood movies, graphic novels, and comic books. Scores of documentaries have reenacted his aerial feats, analyzing his achievements with breathy reverence. His fame extends from the bookshelves of war history buffs to the freezer aisle in the grocery store. If you really want to get your fill of von Richthofen, you can snack on a Red Baron frozen pizza while training on a Red Baron 3-D flight simulator. And of course he's immortalized in the playacting of the world's most beloved cartoon dog, whose animated battle with the Red Baron is embedded in the American childhood imagination and in the Royal Guardsmen's hit song "Snoopy vs. the Red Baron."

The product of a Snoopy-deprived Eastern European childhood, though, I'd never heard of the Red Baron until I came across a research paper, published in 2003, in a fairly obscure journal. The paper explored the performance of German World War I aces—pilots who had downed five or more aircraft over the course of the war. The performance of the fighter pilots was relatively cut-and-dried, determined by a single number, their total documented victories. With his eighty victories, von Richthofen was at the top of the list. Pilots such as Hans-Helmut von Boddien, with five, were near the bottom.

Compiling an accurate record of the pilots' performance served a purpose—the authors were curious how recognition related to it. Recognition, however, is generally much harder to measure. They couldn't use the rank or medals these pilots were awarded as a result of their achievements, because most of them didn't live to see the end of the war.

So they proposed a simple but clever solution. They used Google hits, measuring how many times people searched for these pilots by name on the Internet. The Google hits helped the researchers to gauge the degree to which the world remembered each pilot nearly a century later. This would be difficult to do if the German aces had common names like Robert Hall, one of the Allied pilots, given that there are many Robert Halls out there who have never downed a plane in their lives. The authors chose to focus on the German pilots precisely because they had singular names—such as Otto von Breiten-Landenburg or Gerold Tschentschel—circumventing a frequent problem we bump up against when the subjects of our research point us toward numerous unrelated targets.

Altogether, the 392 German aces claimed a total of 5,050 victories. The eighty Allied planes that von Richthofen personally sent careening out of the sky

is a stunning individual record. But it's a mere 1.6 percent of the total. Pocket change in the larger scheme. Yet he generated 27 percent of the German aces' Google hits. He takes up far more room in our collective consciousness than any of his compatriots.

At first glance, the Red Baron's legacy confirms the popular assumption that strong performance leads to success. It's as simple as that: if you fly flawless missions, pull off dramatic aerial stunts, and hit your targets with ruthless accuracy—if, in essence, you're the best at what you do—you'll be remembered for it, revered over centuries and across oceans. We're taught from grade school onward that perfecting performance is our best strategy for distinguishing ourselves from the crowd. The examples held up to us, the athletes, artists, writers, scientists, and entrepreneurs we idolize, all tend to perpetuate the same paradigm. The self-help gurus and football coaches, the educators and eager parents and pull-yourself-up-by-the-bootstraps politicians, even researchers studying the German aces: we all equate performance with success.

Except then there's René Fonck.

*René who?* you'll probably ask, echoing the befuddlement I felt when I came across a little-read article about him. His obscurity is downright bizarre. Fighting for the Allies in the same theater as the Red Baron, Fonck, a skilled French pilot, claimed to have gunned down 127 German planes. Seventy-five of these victories have been independently confirmed, making him, at the very least, the *second* most accomplished pilot of the war. If we add to his tally the most probable of his unproven claims, we arrive at a total of one hundred or more. That means that for all intents and purposes, Fonck was the Red Baron's equal in aerial warfare, and most likely his superior.

He was certainly a more technically proficient sharpshooter than the Red Baron, rarely requiring more than five bullets to down a plane. Plus, he was a master of graceful maneuvering. One pilot compared Fonck's flying under fire to the quick up and down of a butterfly evading a predator. Whereas von Richthofen actually lost three battles—the last ending his life at the ripe young age of twenty-five—Fonck and his plane were never even scratched by enemy fire. He frequently came back from missions the sole survivor of his squadron, and doing so meant downing planes defensively, using calculation to ensure his escape. His tactics were far superior to von Richthofen's shoot-from-above hailstorm assaults. Yet all we know about René Fonck is contained in a hard-to-find autobiography and a few mentions of him here and there. He's largely been forgotten by time. It's as if the Red Baron, with every plane he downed, created

lasting craters of impact, permanently carving his success into the landscape below. Fonck destroyed planes with equal or greater frequency, but they all crashed with a barely audible thud.

Why? That's a question that fascinates me. Take other examples: Claudette Colvin, an African-American teenager in Montgomery, Alabama, who refused to give up her bus seat to a white passenger in 1955. Her gesture presaged Rosa Parks's by nine months. Same action, same city, same time frame. Yet no one mentions Colvin when students are taught about the heroes of the U.S. civil rights movement. Edison gets credit for X-ray photography, moving pictures, recorded audio, and the light bulb, when in fact *all* were discovered by other scientists or inventors. And then there are the Wright brothers, the inventors of the airplane according to the schoolbooks. Never mind that the first powered flight was executed nine months prior to theirs, by a New Zealander named Richard Pearse. Seemingly, it's the *last* person who makes a discovery that really matters, not the first.

Countless stories are right in front of our noses about deserving people who can't seem to jump-start their dreams. Our favorite restaurant fails, closing in the middle of a busy summer season. A brilliant uncle's gadgets remain little more than patched-together prototypes in his suburban basement. Our kids bang out chords for a piano instructor who's a true talent but never got a big break. We often chalk up such obscurity to bad luck, a crappy hand of cards. But if you're anything like me, you'll find such an answer unsatisfying. It simply doesn't make sense.

Until you begin to look at the data. The Red Baron's and René Fonck's vast difference in lasting renown, despite their indistinguishable performances, speaks to the most fundamental principle of the Science of Success, and our definition of the term "success" moving forward.

*Your success isn't about you and your performance.  
It's about us and how we perceive your performance.*

Or, to put it simply, your success is not about *you*, it's about *us*.

This definition of success is the axiom, or starting point, the foundational premise behind the research on success described in this book. Performance—or what you *do*, whether it's your bike-racing record or the number of cars you've sold or your score on a multiple-choice exam—is certainly a variable where you have some control. You can perfect your performance by honing your skills,

practicing, preparing, and strategizing. You can even compare your performance against that of others and determine where you stand.

*Success*, however, is a whole different category. It's a collective measure, capturing how people respond to our performance. In other words, if we want to measure our success or figure out how we'll ultimately be rewarded, we can't look at our performances or accomplishments in isolation. Instead, we need to study our community and examine its response to our contributions. It's this clear distinction between success and performance that helped us in the lab to identify the universal patterns represented by each of the laws shared in this book.

The collective nature of success helps us explain why the René Foncks of the world go largely unrecognized despite their astounding or rare feats. Sure, recognition depends on the quality of your work; the Red Baron wouldn't be remembered if he were mediocre. But that's not the only factor, not by a long shot, as it were. You can perform well and not be acknowledged for it, an unfortunate truth that most of us know from experience. How often have we watched peers, with comparably meager or even lesser performances, get hailed for their work? Humankind is full of original artists and thinkers whose contributions are largely lost to history because their contemporaries failed to see their genius. You may be writing the best code out there, or saving your company piles of money, or stashing a blockbuster away in a drawer, but if we're not aware of your achievements, then how can we recognize you for them? If we don't see, accept, and reward you for your performance, if we—and by “we” I mean more than just a few isolated voices—don't find your project worthy, it will likely falter, or stagnate, or barely make it off the ground.



Our new definition of success is foundational to the rest of the book. It tells us that success is *a collective phenomenon rather than an individual one*.

If our community is responsible for our success, we have to inspect the social and professional networks that generate collective responses to individual performances. Few of us start our journeys on a stage where thousands hail our accomplishments. Our initial impact is inevitably local, witnessed by our family members, colleagues, friends, neighbors, collaborators, and clients. Yet



occasionally we set in motion ripples that reach beyond our immediate circles, radiating outward and activating a broad communal response. The most successful among us have mastered our networks, using them to achieve a place in the collective consciousness, snapping up valuable real estate in the brains of unlikely people.

The brain isn't a bad way to start thinking about such an enabling network, and collective consciousness isn't a bad way to evaluate our definition of success. We consider our brains as single entities capable of memory, sensation, and thought. But of course brains are composed of a very intricate and densely linked network of neurons. Every thought, feeling, and sensation we experience is caused by a train of excitations flashing through this neural web, with no single neuron solely responsible.

The networks that characterize our success are equally complex. Social platforms like Facebook barely permeate the dense social webs we're embedded in, and handing out business cards at a mixer—the emblematic act of networking—is only the most rudimentary way to use the professional webs enabling us.

In the language of networks, we are all nodes within an interconnected web that links us to billions of other nodes. In order to see the impact that you have on your collective environment, you must look to the other nodes in your network and check how they react in response to your performance. Our collective definition of success reminds us that we need to examine the networks we belong to, strategizing how we can use them to our future advantage. The landscape of a network, its highways and cow paths, its wildernesses and canyons, can reveal the routes to realizing our goals.

Here's a personal example of what I mean. As a scientist, my performance hinges on a single thing: discovery. Right? *Except that performance needs to be empowered by opportunity.* I grew up in Transylvania, a Hungarian kid in hermetically closed Communist Romania, where travel abroad was permitted only to other Communist countries. International conferences were off-limits. I had very limited access to scientific journals. I didn't even have much of a reason to learn English, since the odds I'd leave Romania were basically nil. So no matter how promising I may have been as a budding scientist, my access to the professional networks that are the lifeline for science were severely curtailed.

But then, in the summer of 1989, a phone call dragged me out of my dorm room in Bucharest and sent me packing to my hometown in Transylvania, my exams half done. My father, a museum director of some prominence, was among the last ethnic Hungarians to hold a leadership position in the Romanian political



system. The victim of a nationalist purge of ethnic minorities from governance, he was suddenly stripped of his post and livelihood. One day he was running a network of museums; the next day he was checking tickets on local buses. The change was too visible, reflecting poorly on those who plotted his fall. So they plotted again, removing him from the picture entirely. Just like that, my dad and I found ourselves in Hungary, political refugees. It wasn't what I would have chosen for myself by any means—separated from my mom and sister, I can't remember a time I've ever felt so alone. But once I recovered from the shock of starting a life in a country where I had no friends or even acquaintances, I realized that those narrow-minded officials had done me a favor: by sending us away, they offered me access to a professional network that would have been off-limits in Communist Romania.

Indeed, just three months after, I was studying with a world-class scientist, Tamás Vicsek, who had returned from years of working as a researcher in the United States. He invited Gene Stanley, the most prominent name in my field, to a conference in Hungary, and at the reception Tamás held at his Budapest home, I had the chance to practice my shaky English on the guest of honor. Gene invited me to Boston for my doctorate studies, activating his own professional network to make sure that I was admitted. There were strings to pull, after all. I'd flunked the English-language qualifying exam, a minimal requirement for admission. Still, I somehow found myself in Boston, the Alexandria of modern science, a place teeming with opportunities.

I'm tempted to say that all this happened because I was a promising scientist, that my later success was thanks to my performance alone. But then I think of my peers at the university in Bucharest. Some of them took home the gold in physics competitions I didn't even *qualify* for. There was Dan, who'd already won the International Physics Olympiad as a ninth grader, beating the whole world in topics I wouldn't learn about for three more years. There was Cristian, a gentle giant, who could explain the solution to virtually any problem in his soft, pleasant voice. Both were measurably more accomplished than I was. Yet, lacking a path forward, neither made it in our chosen profession. So no matter how promising I was as a scientist, the same performance that helped me succeed in Budapest and Boston would have fallen on deaf ears in Bucharest. We'll discuss in a later chapter how networks both isolate and embrace us, shaping our prospects in invisible ways. Life in Communist Romania offered me a personal case study, a glimpse of the powerful role networks and the collective played in my own success, long before I understood the science behind them.



The Red Baron and René Fonck each achieved success according to a clear and countable military standard: the number of enemy planes brought down. Compared to their peers on either side of the battle, they were the best at this task. But the discrepancy between how the Red Baron and René Fonck are remembered has little to do with performance. The differences, instead, are due to the collective nature of success. And it's about the networks that detect, acknowledge, and disseminate our achievements to the larger world.

The Red Baron is often described as heartless and exceedingly vain, with cold, emotionless eyes. His autobiography is little more than an account of various acts of violence relayed in an off-putting, self-congratulatory tone. Yet, confronting the terrors of war, his peers were inspired by his bravado. When he flamboyantly painted his plane red, he became the quintessential symbol for the German propaganda machine, bolstering the morale of the German public. His proud face, shadowed by a jaunty peaked cap, appeared on trading cards. Newspapers claimed that the British military had created special squadrons whose only goal was his demise. For all these reasons, the Red Baron became a singular hero. Even his untimely death in combat—the circumstances of which were shrouded in conspiracy—was helpful in maintaining a mythology that might otherwise have been confined to the context of war. A baron by birth and a warrior in death, he was enshrined as an enduring symbol of patriotism and heroism.

The same factors on the other side of the front line should have also pushed Fonck to prominence. And in many ways they did, at least at first. During the war, he received all the honors an ace pilot could hope for. His notoriety even got him elected to the French Parliament. But then the public turned on him. His first mistake was that he wasn't killed. Surviving World War I, he landed in politically murky waters during the Nazi occupation of France during World War II. He also failed as a demonstration pilot, crash-landing on takeoff while attempting the first flight from Paris to New York.

But details aside, the key distinction between the two men is that one was useful to his network and the other was not. The Red Baron's success was about what was happening politically and socially during the war, not only about how many planes he shot down, or how vain he was, or how he felt about his accomplishments. We remember him today because he was once vital to the

German propaganda machine. His reputation was left in the hands of those desperate for a hero to galvanize their spirit. The broad public, responding to the Red Baron's performance, created a myth about him that served its purposes. In other words, *the network found him useful and chose to amplify his success.*

The Laws of Success will help us understand how to jump-start this kind of community interest, so that our performance resonates widely. If our goal is that our work matters to others—and who doesn't want that?—then we need to understand how collective interest in our contributions is generated through the intricate webs we are embedded within.

In the Red Baron's case, his network created a legend so prodigious that it quickly transcended battle lines. Remember those *Peanuts* cartoons where Snoopy salutes the Red Baron from the sinking plane that is his doghouse, as smoke billows around him? It's this sportsmanlike gesture of respect in the face of certain defeat that I find particularly telling. His foe's reputation for aerial combat is so great that even Snoopy, a cartoon dog fighting in the limitless realm of the imagination, doesn't presume he stands a chance.

But as I invoke Snoopy as an arbiter of success, it is important to clarify that the Red Baron was not only successful. He was also *famous*. His unlikely appearance in an American cartoon decades after his death is proof positive. Which raises an important question. Can we separate success from fame? Do we have to?

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The largest round table I have ever seen is in the Nobel Forum in Stockholm, where the Nobel Committee confers each year to decide on its laureates in physiology or medicine. Leading to that room is a corridor with a portrait of each winner. I once visited the forum and lingered in the hallway full of portraits, absorbing the serenity of the space. It felt like visiting a chapel, a shrine to the secular saints who move medicine forward. Each portrait is of a scientist of outstanding performance. And each had experienced exceptional success—their peers had recognized the importance of their work and acknowledged its impact by awarding them the highest honor a scientist can aspire to. Although we don't usually associate celebrity with science, if there's fame in science, they've achieved it.

But as I took in name after name, portrait after portrait—more than a century of hardworking, passionate people whose discoveries had literally saved millions of lives—it occurred to me, stunningly, that I didn't recognize a single face. Not one.

It gave me tremendous pause. I felt chastened, humbled by an obvious truth that had somehow eluded me.

Success and fame are very different animals.

For example, as a writer Vladimir Nabokov is undoubtedly a success. He's known for a lush, complex body of work in addition to *Lolita*—thousands and thousands of pages. But if you ask anyone other than an English major who Vladimir Nabokov is, you're likely to be met with a blank stare or, at best, "The guy who wrote that book about the pedophile?"

It goes without saying that Einstein is a successful physicist. His renown extends beyond the small and insular world of science, a rare feat. Show a picture of him to anyone on the street, and he'll declare, "Einstein, of course!" But if you ask what he's famous for, you'll hear a hesitant answer framed as a question. "He was a genius, right?"

There are multitudes of Nabokovs and Einsteins out there. They accumulate success through their performance, and then their success brings them recognition, radiating far beyond their professional networks. And once people become recognizable names outside of their professional networks, to the point that their future performances are secondary to our appreciation of them, we bestow the mantle of *fame*. Fame is the rare side effect of exceptional success. It's not the purpose of this book to put fame under the microscope, but neither can we shy away from it.

Still, it's fascinating to think about the people who share the strange domain of "famousness." If you want to know who's more famous than Jesus (hint: it's not the Beatles), you can search the Pantheon Project, an online tool created by César Hidalgo, my brilliant former student, now a professor at MIT's Media Lab. According to César, the truly famous are those known beyond their local spheres. Instead of measuring fame using Google hits, as in the ace pilots study, he uses Wikipedia pages—or to be precise, the number of languages a person's Wikipedia page is published in. To be included in the pantheon, a person's renown has to have crossed national and linguistic barriers, and must be represented on Wikipedia in at least twenty-five languages. This single requirement narrows the famous down from practically any minor celebrity or vaguely notable person to 11,341 individuals, members of a fascinating and

motley crew.

On the website, you can explore these legendary figures using a vast array of search criteria. Who was the most famous person born in 1644? Bashō, the master of Japanese haiku. The most famous person born in Barcelona? Seventeen people make the list, but Joan Miró, the painter, tops it. The most famous musician of all time? Jimi Hendrix. What about the world's most famous criminal? Charles Manson ranks third, behind Jack the Ripper and my fellow Transylvanian Elizabeth Báthory, the alleged serial murderer. The most famous American of all time? Not George Washington or Bill Gates. It's Martin Luther King Jr.

We shouldn't be surprised that our Red Baron makes the pantheon, as the forty-fourth most famous military figure, the fifth most famous person born in 1892, and the fourth most famous person born in Poland. His Wikipedia page appears in forty-three languages and has attracted over 8 million views. It's as if his crimson biplane has defied physics, propelling itself through space and time. He leaves René Fonck—who isn't even in the pantheon—in the Wiki-dust, a heroic achiever fogged in by obscurity.

The most famous person ever? According to the Pantheon Project, it's Aristotle. Though far less flashy than the Red Baron, he has remained important in many locales, languages, and eras. Perhaps it's not a coincidence that the giant of both philosophy and lasting fame had insight into success that is relevant several thousand years later. "This [honor], however, appears to be too superficial to be what we are seeking, for it seems to depend more on those who honor than on the one honored." In other words, being honored is an unreliable means to happiness, since it relies on the giver rather than the recipient. Not a bad way to rephrase our definition of success.

Aristotle is a shining example of the majority of people in the Pantheon Project's rankings who have made meaningful and far-reaching contributions, reinforcing the idea that performance is crucial to enduring success. But there are also twenty-one members of the project's "celebrity" category, and they're an interesting bunch. The top ranking belongs to Lina Medina, the youngest person ever to give birth. (She was only five years old at the time, a horrifying thought.) A few beauty pageant winners, socialites, and heiresses figure in the mix, reminding us that fame can be utterly divorced from anything we'd recognize as achievement or even content.

Kim Kardashian is the fourteenth most famous celebrity of all time, appearing in forty-four language editions of Wikipedia. If René Fonck is an

example of outstanding performance without success, then Kardashian is his opposite: an unmistakable instance of success without obvious performance. We know from experience how difficult it is to generate reward even with superior achievements. How is it possible to do so without them?

That's a question that has always bothered me, chafing against the hard-work ethos we're all raised to believe in.

With that in mind, we'll now get into the heart of this book, starting with an important question. How do *success* and *performance* relate to each other? While there clearly is some relationship between the two, the case of Kim Kardashian reminds us that the concepts aren't equivalent.

## THE FIRST LAW

**Performance drives success, but when performance can't be measured, networks drive success.**

As we journey from tennis courts to art galleries, we'll see why it's not the reputable schools we attend that makes us succeed, but our success that makes a school reputable. Most important, we'll learn to see the largely invisible networks that shape our success.

## 2

### Grand Slams and College Diplomas Why Hard Work (Sometimes) Works

My former wife and I considered ourselves fortunate. Our son, Dániel—a likable, smart kid—was doing all the right things. He was taking four college-level classes in the eleventh grade. He had helped launch a school newspaper and put late nights and weekends into editing it. He was on the swim team. He was curious and had multiple interests, and his grades were excellent. His teachers and peers liked him. He seemed happy. And we were happy that everyone was happy.

It wasn't until Dániel started applying to colleges that we realized he had a boulder-sized obstacle in his path—his naive, foreign-born parents. You see, we were both educated in Europe—his mom in Sweden and I in Romania—and we believed in a sole metric when it came to success: performance. Do well in school and you'll succeed. The elite high school I attended in Romania had based its admissions on one exam taken by thirteen-year-olds, with odds of admittance a slim three to one. After tenth grade, I took another cutthroat test, which whittled the number of my classmates in half. Finally, my application to the university hinged on a similar factor—my score on an exam in physics and math. Nothing else mattered, not my extracurricular activities, not the many days I'd spent in the art studio, dreaming of becoming a sculptor, and not even my grades or my research paper that had been accepted by a prominent physics journal in Romania. It seemed as if my performance alone, reflected in exam scores, determined my fate. It never occurred to me that college admissions in the States would be different.

A faculty son, Dániel considered the University of Notre Dame his second home, and for many years his hope had been to return there. But after we moved to Boston, his world opened up. He spent a summer working at MIT and another at Harvard. Then there was Stanford, which he'd fallen in love with when he and